

CHAPTER 4

Green Building Policy Environment

Regulations, Protocols, and Codes of Practice

Vuyo Mjimba

ABSTRACT

The setting of uniform characteristics for a particular good or service is a means of guaranteeing certain minimal quality standards. A mix of public and private policies that include regulations, protocols and codes of practice ensures the delivery of standardised products and services. This chapter focuses on the policy environment governing green building. It presents a broad overview of the global green building space, comparing green building governance in five countries that include the United States of America (US), the United Kingdom (UK), Australia, China and South Africa. What emerges is the importance of governments as champions of green building in both policy and practice. Government signals through policies that reward green building practices form an important primer of voluntary, and often more stringent, building codes that confer even greater 'greenness' to the building lifecycle.

INTRODUCTION

The need to ensure that all anthropogenic activities deliver on the sustainability front is firmly establishing itself globally. Modern economic growth and development policies and practices now routinely emphasise the need to ensure that all capital investments in production, consumption and disposal-after-use activities contribute to the sustainability objective. Notably, changes in the tastes of growing environmentally conscious consumers are driving investors to consider sustainability as a key attribute of marketability. Consequently, sustainability has become an important marketing device that corporations, both large and small, can employ to

simultaneously manage reputational risks, escape regulations risks and increase profitability. For both government and private enterprises, it is now usually compulsory and/or advantageous to visibly demonstrate that both social and commercial activities conform to specified and measurable sustainability attributes. Both the private and public sector are increasingly seeking and achieving objectives that pertain to sustainability through defining minimal quality characteristics for various goods and services.

The built environment has emerged as an important space that is now subject to governance through a range of mandatory and voluntary quality standards seeking to ensure that the construction industry contributes to the global sustainable development agenda. The green building concept has emerged as a plausible solution to the deleterious environmental impacts embedded in traditional construction value chains. Its focus is delivering a carbon neutral or less carbon intensive built environment without compromising standards around aesthetics, comfort and convenience, among other attributes.¹ Predictions are that in the future, it will be inconceivable to risk pursuing a construction project without measured levels of established sustainable building practices throughout the construction value chain.² As more designs and physical green infrastructure emerge and take root, it becomes critical to evaluate the rules and regulations that inform developments in this space. Indications are that the route to a green built environment is governed by both mandatory and voluntary sets of regulations responding to public policies that express a vision of a future characterised by a green built environment. The said regulations serve to ensure the delivery of minimal green standards in terms of factors that, *inter alia*, include safety, comfortable occupancy, use of approved material, and energy standards in residential and commercial buildings that publicly identify themselves as being green constructions.

This chapter examines the various green building standards in selected countries, seeking to determine similarities and differences in these standards. Such an analysis is useful for benchmarking that in principle serves to continually raise standards and in the process improve efficiencies in the design, construction, operation and decommissioning (either through demolition or renovation) of a green building. The chapter reviewed documents from two groups of countries, namely the developed world – represented by the US, the UK and Australia – and the emerging economies represented by China and South Africa. However, before proceeding to that discussion, it is important to understand the theoretical concepts of regulations, policy, rules and codes of practice in the private and public spaces. This is the focus of the next section.

THEORETICAL PERSPECTIVES

The global increase in the magnitude and size of green building is due to acceptance of the concept by both private and public sector actors. The concept seeks to ensure that a building's lifecycle confers sustainable environmental and human health impacts. In this space, building green tacitly grants a developer the status of environmental consciousness and a certain environmental quality standard to the physical building. This may generate economic value from the marketability and high rentals paid by stakeholders, i.e. occupants that also seek to be seen as environmentally aware.³ What is important in this space is that the 'greenness' of a building is verifiable. This demand has given rise to policies, regulations, protocols and codes around green buildings.

The term 'policy' has no standard definition or description. Some of the dictionary definitions of the term policy are 'any course of action followed primarily because it is expedient or advantageous in a material sense' and 'a plan or course of action, as of a government, political party, or business, intended to influence and determine decisions, actions and other matters'.⁴ Following these and other definitions, Smith describes policy under a political theme as the broad framework of ideas and values within which decisions are taken and action or inaction is pursued by governments in relation to some issue or problem.⁵ In this chapter, policy is referred to as public policy. Public policy concerns laws, regulations, decisions and actions. An example of such a broad framework of ideas and values (policy) that result in action is the June 2017 South Korea announcement of a shift in the country's energy focus from nuclear and coal to renewable energy forms and gas under the Eighth Basic Plan on Electricity Demand and Supply.⁶ This is presented as a solution to addressing concerns around nuclear energy and environmental management. However, governments are not the only organisations that plan their courses of action. Private enterprises do the same. In the private sector sphere, policy concerns business strategy formulation and execution and is concerned with intra-firm efforts to improve efficiency, quality, flexibility, responsiveness, business strategy, and other such efforts. For example, the South African private media company MultiChoice has a sustainable development policy that articulates the firm's quest to contribute to general economic prosperity and curtail its impact on the environment, among other related visions.⁷ From these two examples, policy can be said to be a description of a set of basic principles and associated guidelines, formulated and enforced by the governing body of an organisation, to direct and limit its actions in pursuit of specified goals.

While policies present a broad agenda of philosophies and ideals to guide decision-making that results in action or inaction by governments and firms, regulations ensure that policies are enforced.⁸ Broadly, regulations define boundaries of operations in scope as well as standard and state rewards for desired behaviours or sanctions for undesirable ones. The sanctions component of regulations is important for enforcing contentious policies. The government is important in defining limits in specified private and public sector activities. To this end, the governments at either the central (federal) level, the province (state) or local level develop laws and regulations to drive policy decisions. For example, the national Renewable Energy Act of Ghana governs practices in that country's renewable energy sector.⁹ A common practice is to interpret and transmit such national laws to lower government tier laws such as council bylaws.¹⁰ While the government regulations are supreme in any country, there are also rules that apply in different practices, such as among lawyers, builders and doctors, among others. Commonly, these rules are referred to as codes or codes of practice. Such rules are defined through extended periods of continuous practice, experiments, expert judgment and continuous elaboration that specify the minimum acceptable attributes for a particular product, service, result or technical issue. An example of this is the need for the inclusion of fire protection and prevention systems into building construction, as defined by the International Building Code (IBC). In the same vein, green building codes seek to ensure that practices in the built environment embolden innovative integrated designs that decrease a building's impact on the indoor and outdoor environment by increasing resources, i.e. energy and water efficiencies.¹¹ In the process, the built environment and the activities around it have to reduce emissions and waste during the design, construction, occupation and demolition or renovation stage of any building's lifecycle. These codes differ between and within countries.

However, public policies are not solely for state agencies. Instead, they are also subject to interpretation and implementation by non-governmental players that include for-profit and non-profit private organisations, as well as religious and cultural groups.¹² Nevertheless, the state's regulatory function is established and common in all countries and is important in shaping the welfare of economies and society. The private sector sometimes also strives to be seen as an important factor in shaping societal welfare. To this end, the sector has developed a number of voluntary regulations that define production approaches as well as minimal quality standards for a product or service. For example, the International Organization for Standardization (ISO) has regulations around quality management as well as environmental management. The ISO 14001 is a widely recognised environmental

management standard that private and public sector enterprises adopt and maintain as proof of environmental management awareness and practice. Its adoption is voluntary and those that seek accreditation with the ISO incur private costs to comply with the defined registration and membership codes. Maintaining membership through continued compliance with the 'club' rules confers excludable and non-rivalrous club benefits, most prominently connection with the club's positive 'brand name'.¹³ Through continuous audits, members are compelled to maintain specific standards, i.e., waste disposal practices that are beyond what they would have taken outside club membership. What is more important is that by seeking and maintaining association with the private standards, firms often tacitly comply with national and sometimes international mandatory regulations.

An important issue with the mix of policies and regulations (both mandatory and voluntary) is ensuring there is a strict adherence to regulations. This is to ensure that services and products meet their stated standards, and to that end, address policy concerns. Protocols are important tools in this regard. They are a mandatory set of decision-making rules, standards, or instructions created from best practice procedures that bear desired outcomes in a practice.¹⁴ For example, the ANSI/GBI 01-2010 Green Building Assessment Protocol for Commercial Buildings provides a means of determining the status of a building on issues that pertain to environmental concerns and resource efficiency.¹⁵

Therefore, an appropriate and adequate combination of policies and regulations, supported by equally appropriate and adequate codes and protocols, should, in principle, deliver desired policy outcomes. Rapid progress in the green building space against a background of increased environmental concerns appears to be resulting from this combination in many countries. The next section presents examples to this end.

non-compliance and sometimes with technical and financial assistance and incentives to ensure compliance.

While mandatory state driven laws are important, there has been a growth in the scope and magnitude of voluntary regulations and standards. Organisations such as the Forest Stewardship Council (FSC) and the Global Reporting Initiative (GRI) are playing important roles in enforcing and elevating sustainability standards through process and product certification schemes. One of the leading reasons for attaining standards specified by such organisations is gaining good reputation through being known and viewed to be conforming to particular revered standards.¹⁷ An important body in the green building industry is the World Green Building Council (WGBC) established in 2002.¹⁸ Since then council has grown and now comprises several regional green building councils throughout the world. Through the regional councils, the WGBC seeks to guarantee and ensure that the building industry meets defined standards – without interfering with national issues around sustainability.

An important mandatory regulation in the green construction space is the International Green Construction Code (IgCC) developed – and now continuously advanced and improved – by the International Code Council (ICC).¹⁹ The code creates a regulatory framework for new and existing buildings by defining the minimum green necessities for buildings. The genesis of the code was the realisation that an obligatory baseline of codes for green commercial construction was required.²⁰ The IgCC board of directors accepted this drive in 2009 and assembled a focus group of leading industry experts in green building to create the Sustainable Building Technology Committee (SBTC), mandated to draft the IgCC and submit it for public comment in the spring (US season) of 2010. Prominent bodies in the SBTC included the American Institute of Architects (AIA) and the American Society for Testing and Materials (ASTM) International. AIA sought and secured the 2030 Carbon Neutrality Goal within the code and ASTM International was important in ensuring the code gained worldwide reputation and acceptance.²¹

The code is designed for incorporation into national and sub-national government laws for ease of enforcement. Certain requirements of the code may either be disregarded or subject to increased stringency, depending on local requirements.²² Irrespective of the levels of stringency around the code, the focus is to improve environmental sustainability in the building industry by ensuring the required and appropriate site management; energy and water efficiency; the use of sustainable construction materials and services; and reduction in greenhouse gas (GHG) emissions from building occupancy and maintenance – while delivering acceptable and comfortable indoor environmental quality. Although the code was initiated in the US,

the IgCC standards are applied as is or with additional codes and regulations in many parts of the world. The next section outlines specific codes as they apply in the earlier mentioned case countries.

THE US GREEN BUILDING CODES

Although the rhetoric particularly under the Donald Trump Administration suggests that the US is reluctant to deal with issues that concern environmental sustainability practice indicates a country that is leading in the pursuit. Evidence to this end is the plethora of mandatory and voluntary regulations and codes of practice that have emerged to deliver a big and viable green construction industry. In fact, the government has been instrumental in leading the green building thrust. For example, the essence of President Barack Obama's October 2009 Executive Order 13514 on Federal Leadership in Environmental, Energy and Economic Performance was to drive federal agencies towards a trajectory of sustainable building with regard to location, energy, and water resource efficiency through the lifecycle of federal buildings.²³ Key in the order was ensuring that all efforts include federal employees through education and enforcing the desired standards. To implement the order, federal agencies were mandated to explicitly define goals and targets aligned to these policies as well as define monitoring and evaluation mechanisms to monitor progress in meeting the stated goals and targets. More important is that federal employees were to be informed and capacitated to play a role in achieving the stated goals and targets.

Within the ambits of such state regulations, a number of voluntary standards and codes have been defined. The aforementioned IgCC is a mandatory, adoptable, useable and enforceable code intended to reduce the negative impacts of the built environment on the natural environment. The mandatory code works in tandem with a plethora of other mandatory and voluntary regulations and codes, as summarised in Table 4.1, which show that the delivery of green buildings in the US is governed by both public mandatory regulations at the various government tier levels on the one hand and by voluntary standards on the other. The IgCC specifies a mandatory building code to deliver green construction projects. In this space, the United States Green Building Council (USGBC) has developed and released standards seeking to improve the environmental performance of buildings through its Leadership in Energy and Environmental Design (LEED) rating system for new construction.

The rating designations from the lowest to the highest are: Certified, Silver, Gold or Platinum.²⁴ Rating credits accrue across seven aspects that

cover: (i) site selection, (ii) water efficiency, (iii) energy and atmosphere, (iv) materials and resources, (v) indoor environmental quality, (vi) regional priority (the neighbourhood), and (vii) innovation in design.²⁵ One hundred points are available across these categories. Most interesting is that there are mandatory prerequisites such as minimum energy and water use reduction, recycling and waste collection, and tobacco smoke control. This is to ensure systemic greenness. In each category, there are credits that refer to specific strategies for sustainability, such as water and energy efficiency and the use of direct and indirect products and services with low carbon intensities, through issues that include access to public transportation, recycling, renewable energy and daylighting. LEED standards are becoming increasingly stringent and their scope is being widened to include distinct rating systems that address different building types under the labels: New Construction, Existing Buildings, Commercial Interiors, Core and Shell, Schools, Retail, Healthcare, Homes and Neighbourhood Development.²⁶

Table 4.1: A Sample of Mandatory and Voluntary Green Building Standards in the US

Standard	International Code Council's 2012 International Green Construction Code	American Society of Heating, Refrigeration and Air-conditioning Engineers' ANSI/ASHRAE/USGBC/IES Standard 189.1-2011	National Association of Home Builders' ICC 700 National Green Building Standard (NGBS), 2012 Edition	Green Building Initiative's ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings	U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED)	The International Living Future Institute's Living Building Challenge, Version 2.1 (May 2012)
Description	A prototypical code that contains minimum necessities for designs and construction of all types of buildings: single- and two-family residential structures; multifamily structures with three or fewer stories; and temporary structures. The objective is to increase the environmental and health performance of buildings' sites and structures.	A model code containing minimum obligations for increasing the environmental and health performance of buildings' sites and structures. The code relates to the design and construction of all types of buildings except single-family homes, multifamily homes with three or fewer stories, and modular and mobile homes	A rating and certification system that seeks to increase environmental and health performance in residences and residential portions of buildings through appropriate designs and construction approaches	A series of rating and certification systems that seek improved environmental and health performance for all types of buildings except residential structures. Green Globes is administered in the United States by the Green Building Initiative	A series of rating systems aimed at increasing the environmental and health performance of buildings' sites and structures and of neighbourhoods covering the design, construction, and operations of all types of buildings	A certification system that advocates for transformation in the design, construction and operation of buildings
Standard Type	Model code	Model code	Rating and certification system	Rating and certification system	Rating and certification system	Certification system
Mandatory/Voluntary	Mandatory	Mandatory	Voluntary	Voluntary	Voluntary	Voluntary

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Project Type	New construction Additions Alterations	New construction Additions	New construction Additions Alterations	New construction Additions Alterations Existing buildings	New construction Additions Alterations Existing buildings	All
Certification/ Compliance	Designed to be incorporated into a jurisdiction's codes and ordinances and enforced by building officials and inspectors	Designed to be incorporated into a jurisdiction's codes and ordinances and enforced by building officials and inspectors	Has four green certification levels for homes: Bronze, Silver, Gold, and Emerald. Land developments can earn one, two, three, or four stars	Four certification levels, i.e., 1 to 4 globes	Includes four levels of certification: Certified, Silver, Gold or Platinum	Projects must meet up to 20 requirements to achieve full certification. Partial recognition is attainable, including Net Zero Energy Building Certification
Certification/ Compliance Process	All provisions of the model code are designed to be mandatory, except those the jurisdiction indicates are not applicable or those designated as project electives	There are two possible compliance path options: (i) the prescriptive path, and (ii) the performance path	Certification is verified by third-party inspectors. Projects receive points in each subject area for reaching certain performance or construction goals	Third-party review of building documentation and onsite walk-throughs. Does not require any ongoing documentation, but it might be required as proof of compliance	Third-party certification is required. Rating points are awarded on a 100-point scale, and credits are weighted to reflect their potential environmental impacts	Certification requires a review of written elements and a site visit by an independent auditor
Relationship to Other Standards	The National Association of Home Builders' National Green Building Standard (ICC-700) ANSI/ASHRAE/USGBC/IES Standard	International Green Construction Code (IgCC) ANSI/ASHRAE/USGBC/IES Standard 189.1-2011 Some code	LEED standards The National Association of Home Builders' National Green Building Standard (ICC-700) International Code	Building Research Establishment Environmental Assessment Method (BREEAM)	ASHRAE standards LEED	International Code Council's codes

GREEN BUILDING IN THE UNITED KINGDOM

The concept and practice of green building is well established in the UK, where it has been accepted by both the public and private sectors. As in the US, regulations, standards and codes in the green building industry in the UK are both mandatory and voluntary.

The genesis of the 'green' regulations in the construction industry is the wider focus on managing climate change, which has become prominent since the dawn of the twenty-first century. In these efforts, there has been a realisation that the built environment has an important role to play in larger GHG emission abatement efforts. The UK's legislation and policy in climate change management reside within the laws and policy of the European Union (EU). The Energy Performance and Buildings Directive (EPBD) is an important piece of legislation in this regard.²⁸ This law was enacted cognisant of the role of buildings as either accelerants or retardants of climate change. Some of the salient foci of the EPBD in the EU are that each member state has to explicitly reveal the energy efficiency of buildings offered for sale or leasing through availing energy performance certificates. In addition, each member state has to ensure that all new buildings are

...related emissions by 31 December 2020 (with all new

for increasing the number of green buildings through retrofitting existing buildings and *de novo* green building design and construction.

While the state has been making the necessary and appropriate adjustments to drive the green building thrust, the private sector has been doing the same. This is witnessed through the development and strengthening of voluntary green building standards. The Building Research Establishment Environmental Assessment Method (BREEAM) system for rating the sustainability of non-residential building designs, which arose two decades ago, is important in this regard. Accredited buildings attain ratings that range from 'pass' to 'outstanding' based on the following BREEAM Communities: the mandatory BREEAM Communities standards; the BREEAM Communities assessment issues and credits; awarding credits for innovation; the category and assessment issue weightings; and the BREEAM rating level benchmarks. BREEAM Communities comprises forty individual assessment issues straddling six essential technical groups: (i) governance; (ii) land use and ecology; (iii) resources and energy; (iv) social and economic well-being; (v) transport and movement; and (vi) innovation. The respective assessment issues are assigned a number of credits based on their level on meeting defined performance levels.³² Table 4.2 shows the different ratings

An interesting issue is that despite the fact that BREEAM remains a voluntary standard, the majority of local planning authorities require BREEAM certification and rating for all new buildings in the UK. For example, the Home Energy Efficiency Scheme defines high green standards from building products. The fact that public policies have elevated the importance of sustainable construction – as part of the UK's efforts to address climate change and reduce GHG emissions 80 per cent by 2050 – means that green building codes and regulations are likely to become more stringent and some mandatory.

Table 4.3: Mandatory BREEAM Community Standards

Assessment Issue
Consultation plan
Economic impact
Demographic needs and priorities
Flood risk assessment
Noise pollution
Energy strategy

Building Code of Australia), which comprises the two-volume Building Code of Australia and the Plumbing Code of Australia. The Council of Australian Governments (COAG), seeking to incorporate all on-site construction requirements into a single code, established the NCC. The NCC standards are developed and administered by the Australian Building Code Board (ABCB).^{35,36} The NCC seeks to efficiently present nationally consistent and minimum necessary building design and construction standards that pertain to safety, health, and sustainability, among other standards. The NCC is updated annually to ensure its relevance and to incorporate new realities. On the sustainability front, water and energy efficiency are key focus area of the code. The NCC's regulatory enforcement as well as deviation jurisdictions reside in the national and territory governments through technical committees with representation of and from national, territory governments, and the Building Ministers' Forum (BMF). A salient point of the NCC is that it does not prescribe design, material, component type, and construction methods to attain its standards. This approach avails a plethora of compliance pathways. Within the ambit of the NCC, the Green Building Council of Australia (GBCA), has and continues to define the voluntary green building standards for buildings that seek to attain accreditation from and rating by

The ratings for buildings is obtainable using three tools: (i) the Green Star – Design and As Built aspect; (ii) the Green Star – Interiors; and (iii) the Green Star – Performance aspects. The Design and As Built aspect, as released in 2017, relates to sustainability outcomes from the design and construction of new buildings or major refurbishments, across nine key categories. The matching interiors rating assesses the sustainability outcomes of interior ‘fit-outs’ also across nine similar categories. The Green Star Performance rating relates to the operational performance of the buildings’ same impact categories.⁴⁰

The Green Star Communities rating arises from an assessment of the planning, design, and construction of large-scale development projects at a community, precinct, or neighbourhood scale. The approach avails an arduous and all-inclusive rating across five environmentally significant categories, as shown in Table 4.4

Table 4.4: The Five GBCA Green Star – Communities Categories

Category	Category Aims
Governance	To deliver climate change resilient communities through

scores under the considered parameters determines a building or community's rating, which in Australia ranges from one-to-six Green Stars, as per the scores indicated in Table 4.5

Table 4.5: The GBCA Rating System

Green Practices	Score	Green Star Rating
Minimum	10-19	One Star
Average	20-29	Two Star
Good	30-44	Three Star
Best practice	45-59	Four Star
Australian Excellence	60-74	Five Star
World Leadership	75+	Six Star

Source: GBCA⁴²

The green building movement, as measured by the GBCA has indeed gained

builds. In addition, occupancy generates waste. As part of the global effort of addressing environmental degradation, China is working to ensure that its built environment contributes to both national and global environmental management efforts with a focus on combating climate change. Both tacitly and explicitly, the country has engaged with the green construction focus for more than six decades in efforts traceable back to the 1960s, when the concept of ecological architecture was proposed.⁴⁵ Since then, China has engaged with the sustainable development agenda for the built environment, contributing through the green architecture movement and largely focusing on designs that are energy efficient. The importance of this thrust is indicated by the fact that it is mentioned in a number of the country's five-year development plans. Perhaps one of the biggest public displays of this focus was when the country's capital Beijing hosted the Olympic Games under the 'Green Olympics' tag. Under this tag, constructions were evaluated under the Green Building Assessment System for the Beijing Olympics (GBAS-BO).⁴⁶ The assessment was based on the performance of different parts of the building lifecycle: the planning stage; the design stage; construction; and the last stage of inspection, operation (occupancy) and management. GBASBO was specific to the games venues and not applicable elsewhere. To expand the evaluation and rating to cover other buildings, the Ministry of

Table 4.6: Evaluation Scheme of Residential Building in China

Star Level	Regular Option (40 Option)						Premium Options
	Land	Energy	Water	Material/ Resources	Indoor Environment	Operation & Management	
	4	2	3	3	2	4	0
★ ★	5	3	4	4	3	5	3
★ ★ ★	6	4	5	5	4	6	5

Source: Geng *et al*⁴⁸

The star rating of a building is determined by the minimum rating of each rated component and not the sum of components addressed. A key issue is that a building must meet all the mandatory aspects prior to evaluation. The Chinese Government is focused on accelerating the country's green building thrust. To this end, MoHURD has permitted provincial green building offices to administer the one and two label applications but retained applications for the three-star label. China's National Climate commitment aims to ensure the certification of more than 50 per cent of all new buildings as green buildings by the year 2020.⁴⁹

Table 4.7: A Sample of Green Building Regulations in China

Type	Standard or Code	Role of Standard or Code
Guidance	Chinese Ecological Residential Assessment Handbook (2001)	Supplementing, guiding and improving the standards and codes of the era
	Green Building Evaluation Technology Conditions (2007)	
	Green Building Evaluation Identity Management Method (2007)	
Beijing Olympics specific	Green Building Assessment System for the Beijing Olympics (GBASBO)	Guiding construction for the Olympic Games in Beijing
For every building	Code for Green Building of Civil Building (2010)	The importance of building design elevated and set to deliver energy and water efficiency and land savings in public and residential buildings
	Code for Green Construction	Improve resource efficiencies through engineering and building management
	Code for Green Building Operation	Deliver efficient and sustainable

limited focus on residential properties and focused on energy savings, the standards now cover efficiencies in all resources related to buildings, from design, construction and occupancy to demolition or renovation. In addition, the scope now covers virtually all types of buildings – from residential to hotels, hospitals, schools, museums and exhibition halls.⁵² The rapid progress is attributable to cooperation between government departments. For example, the ministries of Construction, and Science and Technology are working together in research, focusing on procedures for green building planning; the structural systems of green building; green building materials technology; and indoor environmental pollution.⁵³ More importantly, the government of China offers incentives for the greening of the construction industry. This is likely to lead to an increase in the quality, scope and magnitude of green buildings in China.

GREEN BUILDING IN SOUTH AFRICA

The Department of Public Works (DPW) – with the National Department of Human Settlements (NDHS) exercising an oversight role over planning of the country's social housing, governs the construction industry in South Africa. The Department of Public Works (DPW) is responsible for the design, construction and maintenance of public works, including roads, bridges, dams, and other infrastructure. The National Department of Human Settlements (NDHS) is responsible for the development and implementation of national housing policy, including the design and construction of social housing. The Department of Public Works (DPW) and the National Department of Human Settlements (NDHS) are working together to promote green building in South Africa.

arsenal for contributing to the global drive towards climate change management through reducing pollution and adopting resource efficient practices. The framework seeks to advance the local focus on creating a green economy that enhances skills, creates jobs, and improves the viability of local authorities by reducing the burden of infrastructure delivery and maintenance.⁵⁸ To this end, the NFGBSA focuses on sustainably managing both the indoor and outdoor environmental conditions in the built environment without compromising comfort, aesthetics, safety and other related concerns. It proposes the adoption of building regulations and standards that promote the increased use of resource-efficient designs and technologies as well as the sustainable utilisation of natural resources in delivering such built environments in both new and refurbishment construction works. In addition, it has a focus on designs and installations that enhance indoor environmental quality. The NFGBSA is set to advance the South African Government's commitment of reducing GHG emissions through a variety of mechanisms such as green building.⁵⁹ South Africa seeks to reduce its GHG emissions by 34 per cent by 2020 and 42 per cent by 2025.

Formal engagements with the green building concept in South Africa is traceable back to 1997 when the Council for Scientific and Industrial Research (CSIR) and the South African Property Owners Association (SAPOA)

such proposed buildings as Green Star SA certified, because certified designs assure interested parties that green building considerations will be incorporated. When construction is completed, an application for rating is submitted and an 'As Built' certification can be awarded to confirm that construction process and all other relevant ancillary processes followed the dictates of green practice to specified levels.⁶²

A building that is retrofitted and improved to meet some of the dictates of green building specifications while under occupation attains a rating under the Green Star SA system: the existing building performance tool that only awards a rating of one-to-three stars. This rating acknowledges that existing buildings are on a 'green route' while occupied and in operation. Outside all these conditions, certification ratings range from four-star at the lowest to six-star ratings. Table 4.8 shows the rating labels, scores (out of a maximum 100 points), and interpretation of the applied standard level of a rated building.

Table 4.8: GBCSA Rating System

Green Star SA	Weighted Score	Standard Level
Four-star	45-59	Best Practice

THE EMERGING BIGGER PICTURE IN GREEN BUILDING RATINGS

While the four case countries outlined here follow different standards and approaches in developing and growing their respective bases of green building projects, a common driver to their focus is seeking to deliver a sustainable built environment. This is important for the broader focus of delivering the objectives of sustainable development and environmental management – most prominently climate change management. Transitioning from long established design, construction, occupancy and demolition or renovation practices is often difficult and in some cases, costly. The difficulties and cost increases arise from the need to abandon old and often inefficient practices, habits, and designs to adopt, familiarise and accept new efficient and thus sustainable ones. This is akin to creating a new set of knowledge-based assets for the construction industry. Policies and legislation can play a role in this regard – initiating green practices in this case.⁶⁴

What is important in this space is influencing individuals to adopt green practices in large numbers, both in private and public practice. A challenge in influencing behaviours is determining and applying the appropriate set of stimuli to ensure the desired responses. This arises because a plethora

In the UK, local governments have moved from mandating minimum standards for renewable energy requirements on new developments under the so called 'Merton rule' to the economic incentive approach through the introduction of Feed-in Tariffs (FITs) and the Renewable Heat Incentive (RHI), as well as Enhanced Capital Allowances – a form of tax relief for the installation of renewables.⁶⁸

In China, the Shanghai's Changing District has established an energy-monitoring platform that tracks 160 of the district's 165 public buildings. Under the scheme, the district has provided US\$3.34 million in subsidies aimed at assisting building managers to achieve greater energy efficiencies in their buildings.⁶⁹ This incentive scheme has lowered the payback period for the private sector, which in turn has exhilarated them to invest an additional US\$20.33 million in the district.

In South Africa, as from 1 November 2013 and amended in the year 2015, Section 12L of the Income Tax Act allows deductions in respect of energy efficiency savings.⁷⁰ This law permits taxpayers to claim deductions of nine cents per kilowatt hour, or kilowatt hour equivalent, of energy efficiency savings made against a baseline measured at the start of each year of assessment. The claim for tax deductions applies to all measured and verified savings achieved before 2020. The scheme requires registration

initially – and later on perhaps universally. In this journey, cooperation between the government and the private sector is not just a desirable but also a must. Even in centrist China, the private sector has a role in delivering and at times even advancing green building standards and codes. This is because the urgency of managing environmental degradation requires an ‘all hands on deck’ approach. Neither the state nor the private sector can solely advance research, policy formulation and implementation in this space. What is important is that the laws and codes that arise are stringent enough to confer the sustainability that will deliver a liveable world to future generations.

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